

4D



An Architectural Synthesis Project

4D: An Architectural Synthesis Project
Adam Gilbreath
ARC 497
Instructor: Jesús Robles

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INTRODUCTION

The thought process and rationale of the designer inherently affects the nature and impact of the design produced. The focus of this project is to generate and distill a philosophy of architecture that allows professionals within the field and those adjacent to rationalize function, aesthetic effects, and the environment within architecture in such a way that it frees up space for ethical, environmentally conscious design that encompasses all aspects of architectural design equally.

We will first address our definition of architecture, followed by a larger discussion of the application of Object Oriented Ontology (OOO) and other philosophies within architecture. We will argue that within OOO by adding a time axis to every object and conceptualizing them as existing within “four dimensions” (the fourth being time) we can utilize the effectiveness of OOO in describing function and aesthetic effects, without sacrificing the methodologies brought about by new materialism in architectural practice. Which have merit in their abilities to rationalize the environment and the architectural objects relation to it. Following this will be specific critiques and writings on existing works within the field through the proposed philosophy. Finishing with my proposal for future work with this project in spring of 2024.

A WORKING DEFINITION OF ARCHITECTURE

Throughout this work we will be referring to works of architecture as **architectural objects** or **design objects**. This is because our definition of architecture extends slightly beyond one that is limited to only buildings. I am also interested in the architectural qualities of sculptures, paintings, caves, termite mounds and all other sorts of architectural edge cases that do not cleanly fit into the category of “buildings”. For the sake of this project, Architectural Objects are anything that is constructed, serves a function and has an inherent relationship with both aesthetic effects and the environment. This definition is by no means exhaustive, and is by no means definitive, however it will lend us a necessary frame to unpack architecture through.

FUNCTION

Function is the use-case of the object: how everyone who isn't the object can utilize it. Architecture at its base level is the construction of something for an intended function. This can and does shift with time, is never stagnant, and frequently departs from the intended function at the time of design. Function exists outside of the intent of the designer. If someone designs a teapot, there is no reason it cannot also serve the function of storing soup. While this function is not the intent of the teapots design, it is still a possible use of the object that is a part of its functionality and identity as a whole.

An edge case of these functional objects would be architectural objects that lean towards the world of art, like the work of Donald Judd. Judd's work, I take to be architectural in the sense that

the function of Judd's construction is solely the creation of space and an aesthetic effect. The form the object takes has a distinct mass to void relationship. Within his "untitled works in concrete" the mass, is the landscape and the concrete. Which are viewed and held apart from the volumes internal voids and the space between the volumes. This inherent creation of space is what makes Judd's work architectural, even if it only serves that one function. If something is constructed and serves the function of making space I would argue it satisfies this aspect of architecture.

An architectural object can certainly serve more functions than just creating space. The most obvious examples beyond this would be the program of the building, such as a home, office, or store. However, creating space is the only function that is inherent to all architectural objects. There is no object that is considered architectural and has no spatial qualities to it. Similarly, there is no architectural object that has no function.

AESTHETICS

Every architectural object has an inherent **aesthetic effect**. That can be in the form of beauty or can be in the form of other effects. Many civic institutions are built in a brutalist style in order to convey power and strength. Some people do find these beautiful but there is also another aesthetic effect conveying the power and strength inherent to that architecture. The architectural object however in all instances has some relation with both a function and aesthetics.

This is "civic functions", and "the portrayal of power" in our last example. A given aesthetic effect is only generated by the objects that surround it. The viewer, or "experiencing" object interprets the aesthetic effect of the objects that are generating it. We can come to understand that certain objects lend themselves to these effects more readily but the experiencing object will be the one that dictates the exact nature of it. Some will find beauty in brutalism, some will find beauty in rococo style buildings.

Beauty is a particular aesthetic effect that architects find themselves frequently concerned with and warrants some discussion. Beauty isn't had by an object but instead is interpreted from specific interplays of an object's qualities. It is, however, something that is desired from an architectural object. While it is not necessary that an architectural object that is beautiful is considered to be better and sought after, humans do gravitate to beautiful things, even prefer them. Take a restroom for example, where beauty takes a back seat to the function of being a place to defecate. It is maybe not necessary that restrooms become beautiful, but maybe it would be preferred by those who interact with them regularly.

Every object has the potential to become beautiful or aesthetically pleasing, but these effects are experienced at varying levels and affected by many external factors. People experience beauty in different ways however there are maybe some things that exhibit a universal sense of beauty. Everyone seems to be enthralled by cathedrals, for instance.

All architecture has an inherent aesthetic effect that can be any number of things beyond beauty. A given architectural philosophy should then be able to rationalize where all of these aesthetic effects come from, so as to design in such a way as to provide the intended one.

ENVIRONMENT

There are two forms of relationships between architectural objects and the **environment**. There is the environment as it influences the object, and the object as it influences the environment.

The environment, as it influences design, pertains to how we react to the environment that a structure exists within. For example within Tucson, Arizona's climate, adobe brick and other high thermal mass construction is a vernacular material. This style of construction came about because the thermal mass of these materials does an excellent job at keeping spaces cool, as well as being incredibly resilient within the dry climate of Arizona. These materials are utilized because of their efficiency within the environment. Beyond materials, the environment also can inform the way windows are built to capture specific views or allow prevailing winds to pass through a building. More generally the environment will influence architectural objects towards the forms that optimize human comfort. The environment also influences design via the context, natural or manmade, that surrounds an architectural object, as well as the cultural, and socio-economic influences upon it. In other words the environment in this definition will also include notions of place: geological, political,

cultural or otherwise. Adobe and high thermal mass construction in this regard has also become a part of Tucson's culture and so is seen as favorable among inhabitants of the city even beyond its environmental efficiency.

Our other category, design as it influences the environment, pertains to the effects the design object has on the environment. For example, when an architect elects to use a particular material, that material then must be ripped up from the location it exists at and moved to the site at which the object is to be constructed. Depending on the sourcing of the material this could have a varied impact on the environment. Specifying a type of wood only harvested on the other side of the planet would result in carbon emissions from transportation costs and many other environmental side effects. While specifying a type of wood grown locally and sustainably would have a much smaller carbon footprint. Simultaneously beyond the ecological environmental impact these decisions represent shifts in "supply/demand systems" around these products and the locale they are going to. Consistent local sourcing calcifies that supply chain increasing its efficiency, or consistent sourcing across the globe calcifies and intensifies the flow of objects from there and the emissions that come along with that process. These decisions don't just affect ecological environments but socio-economic cultural environments. Similar environmental impacts happen on the other side of the object's lifespan. After the design object's construction it will decay. The use of plastics within a wall system of the project will remain in the environment as the project becomes ruined. Alternatively, if there are systems in place for repair that allow it to

maintain its shape and prevent decay into the landscape, the project's fallout could be much different. The nature of this decay can also affect the way in which our social environment interacts with it. We interact with ruins like chaco canyon and machu picchu much different than the abandoned warehouse downtown. All of these effects are brought to the environment by the design of the object and its relationship with time and decay.

THE RELATIONSHIPS BETWEEN FUNCTION, AESTHETICS, AND ENVIRONMENT

The environment that contains a given architectural object has interesting relationships with both aesthetics and function. These become important within the larger scope of the project, as a large portion of the effectiveness of both function and aesthetics are largely environmental in nature.

Function and environment's relationship is the easiest to describe, as function for a constructed object is dictated by the person doing the constructing. A need is seen, a need is met through the act of creation and the function an object serves is dictated by the environments (cultural, social, and political) that generated it. The success of the function is dictated by the environment that encompasses it. It is the surrounding culture that dictates whether the given design object was successful in fulfilling its purpose. A given cultural environment could also change over time, simultaneously changing the perceived effectiveness of the architectural object. We can see this in the

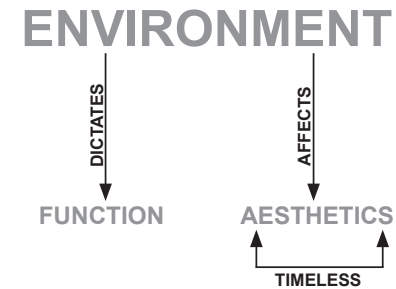


Figure one: Relationships Between Function, Aesthetics, and Environment



15 untitled works in concrete, Donald Judd. Image: Holzherr, Florian.¹

present shift towards more environmentally conscious architecture (in the ecological sense of the word). A coal power plant is seen as less effective at fulfilling its function than a solar farm, even if they produce the same amount of power, because of their different effects on both the cultural and ecological environment. This has led to a preference for solar farms as an architectural object fulfilling that function. Beyond this both still have a large impact on the environment, are directly tied to capitalist values and environments, and tied to the generation of electricity as a commodity.

Aesthetics and the environment's relationship is a bit trickier to navigate. I will use Donald Judd's *Untitled Works in Concrete* to illustrate how this relationship works. Judd's works in concrete are located in Marfa, Texas. They are large boxes (2.5 m x 2.5 m x 5 m) arranged along a north-south axis within a grassy field within the premises of the chinati foundation (which owns and preserves a large collection of his work).

There is a timeless aesthetic effect that resides within the boxes. This timeless aesthetic effect is born out of the objects and their composition alone. It could be transported anywhere to similar effect. That is to say, there is an aesthetic quality that is inherent to this particular form. Within the proportions and arrangements of the volumes we find a particular sense of beauty. While the particulars of the aesthetic quality may change as its location does there is still some underlying aesthetic aspect that exists regardless of its environment. This notion of an aesthetic effect I believe is harder to achieve. Thus, I have grown interested in and become pursuant of it.

However the exact nature of this effect will be different depending on the sun angle, context, and environment but, the aesthetic effect that lies in the object itself and composition would remain the same. There is one form of aesthetic effect that lies within the object itself and another that exists in its relationship to the environment. When experiencing the boxes we can observe the composition of the boxes contrasts in the openings and closures of the boxes without referencing the environment. But, the way the sunlight interacts with the boxes to form shadow, or the way in which the boxes frame the landscape also generate their own sense of beauty. It would seem the landscape plays a large role in the aesthetic effect of the boxes. Without the specific landscape they are in one could not enjoy the way they interact with that specific horizon or frame that specific view. There are then two related but separate aesthetic effects attributed to an object: those inherent to the object itself, and those that exist in its relation to the environment.

On the other side of this environment-aesthetic effect relationship is the particular aesthetic effect that is only caused by the architectural object's relationship to the environment. The interplay of this specific horizon line and the forms of the boxes only exists within this environment and moving them to another place would destroy any aesthetic effect particular to this interplay. It is not my intent to say either of these aesthetic effects is better than the other. I merely note that there seems to be a difference in these two forms and we will need to be able to rationalize both.

OBJECT-ORIENTED ONTOLOGY

OOO focuses on objects. Within this view everything is an object of some kind, with an object being anything that

“cannot be entirely reduced either to components of which it is made or to the effects that it has on other things” (Harman).²

For example, a hammer is an object. It is larger than atoms that make it up, but smaller than the tool box it is inside. You cannot describe a hammer solely by its effects, in the same way you cannot describe the hammer solely by the matter it consists of. Even though the hammer is an object, it does not make the tool box or atoms not objects. They are also objects; just at a different scale. Inherently within the view we have a way to address the various scales that architectural objects operate on. Each object has four parts that it consists of: its sensual qualities (SQ), the qualities of a given object that we directly perceive and interact with; its sensual object (SO), the thing to which we attribute these sensual qualities or the object in how we can perceive it; its real qualities (RQ), the qualities inherent to an object and which we can never access; and the real object (RO), the thing-in-itself that exists withdrawn from our perception but, foundational to all parts of the object.

Let's look back at our hammer and address these four parts. When we look at the hammer, we are greeted immediately by its sensual qualities (SQ). The SQ consists of the smoothness of the handle, the weight of the head, the colors of each, and so on. These qualities are the things we attribute to the object via our senses; this is the shifting layer of attributes we ascribe to objects as we perceive the world. As we

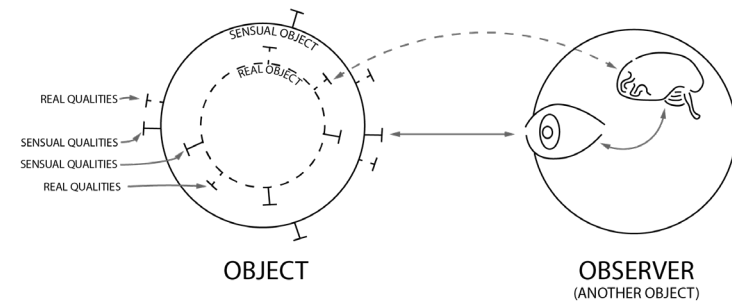


Figure one: Object's Structures and its Observer



understand these we become acquainted with the sensual object (SO) of the hammer. The SO is the object as we come to know it through our senses, through the way in which the thing manifests itself within our world. However, if we were to try and come to know all attributes of the hammer, there would still be some things we could never come to know: those things which are not made readily available to our senses, or in other words, are withdrawn from them. These are what constitutes the thing in-and-of-itself, remaining forever withdrawn. No matter how scrupulous our studies of the hammer, we are restricted to understanding its nature in a sensual way; we are limited to the SQ and SO. Which brings us to the last two parts: the Real Object (RO) and its inherent real qualities (RQ). The RO exists withdrawn from our perception and unknowable to us. It constitutes the object as it is beyond how we can perceive it. While its RQ are those qualities that distinguish it from other RO, these qualities are also forever withdrawn from our perception. Think of these as the objects and qualities they have as they exist outside of our perception.

We can think of these two forms of objects as concentric pin cushions. The sensual object surrounds the real object, with "pins" that are the Sensual or Real qualities we attribute to them, we can attribute both sensual qualities and real qualities to either type of object (see figure one).

The way in which the view is used to address architectural objects is through an exploration of the tensions that exist between these varying aspects of objects, with the architectural object itself being one of these objects.

New Materialism, as a school of thought, tries to understand the world as material flows or "matter-energy". The materialist thinker looks at the world not as discrete objects like books, pens, and computers, but instead as the matter that constitutes these objects. The book, for example, is viewed as a collection of atoms, some of which had their origin in trees, that then through a material flow arrived at this locale where it is presently, in the configuration that it is in. The world becomes a shifting landscape of flows and material organizations.

Architecture then becomes one of these material organizations. A given architectural object becomes a conglomerate of the constituent matter and material flows that make it up. This line of thinking is how we arrive at Luis Fernandez Galiano's Definition of architecture:

"Architecture can be understood as a material organization that regulates and brings order to energy flows, and simultaneously and inseparably, as an energetic organization that stabilizes and maintains material forms."³

But, I will argue, these materialist views only give us a framework to talk about objects as the material they consist of, and neglect the thing-in-itself as it is beyond our perception. Even within its present application in design it is used solely for its insight into relationships from the building outward to its environment, as a means of analyzing material flows. The view is largely an environmental stance and research trajectory within the field of architecture. The view itself has merit in other applications, namely the introduction of posthuman thought into architecture, and as a means of conceptualizing architectural objects

through time. However this view fails to give us the means to rationalize those qualities that are pertinent to our experience of objects.

Within Materialist thinking we are forced to attempt to rationalize function as the flows of the matter and their interacting organizations. Let's look at a hammer. This would be viewed as the organization of matter arranged in such a way as to have a weight on one end and a handle by which to leverage that. While this does allow for a notion of function, it doesn't really seem the function is inherent to the object beyond its material qualities, it's as though it so happens to be arranged in such a way that it can be used for that function. However, there is no deeper functionality that exists beyond the surface qualities we ascribe to it, as I will argue.

Suppose we were to think about this same hammer outside of its material aspects. We can now say, the hammer functions because it can withstand the force from the blows, and drive a nail down with its sufficient weight. We can describe the qualities of the hammer that are useful to how it serves its function. Descriptions of material flows don't allow us to say anything meaningful about the function of the hammer, or understand what exactly is inherent to it to allow it to serve that function.

I will note that Manuel De Landa has brilliantly extended this line of thought to talk about larger material structures and flows, and his line of thinking has become incredibly impactful upon architectural thought (including my own). An example of this line of thinking would be to think of trucks on highways serving the function of moving material from one city to another. We would think of them, not as trucks serving this function, but instead as a material organization that is doing so.⁴ However, I do think this still fails to address what is inherent to these larger

structures that makes them useful. De Landa offers us a language to address structures of matter thoroughly; however, there is no method for applying meaningful language to the function of the structure as it exists beyond perception. We can gain the ability to apply this language, while simultaneously using the structures De Landa conceptualized, within OOO.

A hammer has the quality of having a specific length and a weighted head on one end, and it is these qualities that make it functional when performing the task of hitting a nail. However a broader analysis of function shows that; function is opportunistic in nature. Let me explain, look at our hammer again. The hammer has not been an idle example; as it is the one of the subjects of Heidegger's "tool analysis" in his work Being and Time.

Heidegger argues that the hammer has those traits dormant within it that allow it to perform the function of hammering. We understand that they are attached to the object of the hammer. The hammer while in use hides its sensual qualities to us. We are not aware of its quality of being useful until it breaks. During the instances where it is functioning properly, it recedes from our awareness, and we are left with an object that is carrying out a use while our consciousness is focused on the task of hammering. We become unaware of all sensual qualities of the hammer. It is only upon breaking, or being too heavy, or some other disruption to the function, that the hammer snaps back into reality and we become aware of its presence again. It is this shift in focus that makes us aware of the surface level attributes of sensual qualities and hints at the real object beneath them that is withdrawn from

our senses. From this Harman concludes,

"Heidegger shows that the thing-in-itself enters and disrupts all thought and action in this world. We are always caressing the surface of things, only half aware that they are more than our theory or praxis takes them to be at any moment. To summarize, what Heidegger bequests to philosophy is a model of individual beings impenetrable to the human senses and intellect, but equally opaque to everyday human use."⁵

We stop noticing the sensual qualities and instead subconsciously intuit some other quality beyond the sensual object. We briefly understand that there is a real object beneath the surface of the sensual object we believe we are interacting with. The hammer gains this extra real quality of being useful for hammering. This same process is replicated in the creation of aesthetic effects un-related to function. The sensual object is alluding to the real qualities of the hammer that we cannot perceive directly. When an object functions so well that we stop taking notice of its sensual qualities, we find beauty in it, in the form of accidentally coming to know some aspect of the real object.

We cannot accurately describe the function of an architectural object as solely material in nature. We need to understand that it has qualities beyond the sensual and material. The same tensions we find in the function of objects between the SO we access and RO that is withdrawn generate the aesthetic effects we associate with architectural objects.

AESTHETICS



Materialism is forced to rationalize beauty as those organizations of matter that are arranged in such a way that when our organization of matter interacts with it our brain's matter, fires in such a way as to make us perceive beauty. We have no real way of addressing the constituent parts of something beautiful. There is no object of beauty, just arrangements of matter. We are left to interact with something that feels so beyond the material in a purely material way. The beauty of a painting is not found within the matter of the paint itself but instead in the contents of the larger object and composition. To attempt to arrive at an understanding of beauty in this regard we are left with only empirical means of addressing it. If we confidently state within our materialist views that there is only matter then we have to attribute all properties to that matter.

But this seems off. It would seem there is something beyond this material interaction that is bringing about this effect. The facts we explicitly state about an object don't contain all the information about what makes it beautiful. Let's look at a simile as an example of this. If we say "A teacher is like a candle", and we understand this to be the collection of atoms that participates in the act of teaching is like a collection of wax atoms structured around a wick, we lose the poetics of this statement. The beauty of the metaphor lies within some aspect that is not inherent within the physical elements of the teacher or candle, but instead in some idea that is withdrawn from our immediate perception. This thing beyond the physical is hard to rationalize within a materialist framework, but as we will see later, is much easier to rationalize through OOO.

Aesthetic effects instead are born from an

interaction in which we attempt to assign sensual qualities to a real object that we understand does not sensually express these qualities. Let's look at a rather simple simile we used earlier: "a teacher is like a candle". Harman explains that the teacher we understand is physically and sensually nothing like a candle. The candle's sensual qualities we are trying to assign the teacher and the sensual object we understand the teacher to be do not line up. But, we derive some meaning from this comparison, can even imagine this candle like teacher and the qualities they possess, and so we intuit some meaning from this statement. We upon hearing this generate a real object that is apart from the object of the teacher. That is this teacher-with-candle-like-qualities. This teacher is so out of joint with the typical sensual qualities we associate with teachers that it becomes withdrawn, a real object apart from our perception, but with the sensual qualities of a candle around it.⁶

The aesthetic effects are born out of the impossibility of defining this interaction by its literal description. In this we play the role of the mysterious withdrawn teacher's real object and play the role of the sensual candle qualities that surround it. We as the observer of the aesthetic effect hold onto the actual meaning that escapes the sensual qualities we are used to. The tension between object and qualities may be present externally, but it is within our own internal theater that the true meaning plays out.

To summarize: aesthetic effects are born from objects that are unable to support the sensual qualities that we are trying to assign to them, and so we imagine and host another real object that supports the sensual qualities we are trying



to assign. In a more architectural sense, these objects express some quality that we cannot associate with them, concrete that floats, aluminum that dissolves, or steel that billows in the wind. Objects that subvert the expected qualities of the object we are presented with. Imagine a building that as an object presents us with the qualities of a cave. It is dark, light is sparse, and the corners hide in shadow. These are not the sensual qualities that we expect from our typical building, we hold a nostalgic representation of what a typical building should be and we experience aesthetic effects in the disparity between expectation (nostalgia) and the reality of the qualities presented. This is similar to Michelangelo's "La pieta", he carves the stone in such a way that it appears to crease and fold like fabric, it is not that we are surprised by it, but instead that there is an apparent and palpable tension in stone that folds and flows. The Aesthetic effect is born from tensions between objects' qualities.

These objects with their aesthetic effects and functions, however, are not stagnant. The environment as it influences an object, and the object as it influences the environment, still play an important role in an architectural object's existence. If we address this with either Materialism or OOO we also need to consider posthumanism and flat ontologies, specifically their role in how we conceive of architecture's relation to the environment.

POST HUMANISM AND FLAT ONTOLOGIES

Flat ontologies posit that all things that exist, exist with equal weight to one another. My perception and existence is no different than that of a rock. Similarly, Posthumanism rejects the idea of anthropocentrism, or that the human perspective should take center stage. Although I am at risk of oversimplifying, I will address these together and call them both "nonhuman thought". A product of the "nonhuman turn", a term coined by Richard Grusin to describe this trend in the humanities.⁷ Jane Bennet, in the same collection of essays, defines the nonhuman turn as a school of thought that

"...can be understood as a continuation of earlier attempts to depict a world populated not by active subjects and passive objects but as lively and essentially interactive materials, by bodies human and nonhuman."⁸

Both OOO and New materialism subscribe to some form of Posthuman Thought. Within New Materialism everything consists of the same "matter-energy" and so nothing has a higher

ontological standing than anything else. OOO begins here as well, but will concede that while it is important to view the world initially as a flat ontology, we at some point must come back to our human view that we are able to comprehend it from. Inherently our version of existence is entirely subjective. But we come to understand the world from our own human experience, and it is notably difficult to try and understand a rock's experience with the same depth as our own.

But Posthuman thought has brought about notable ethics into the architectural discourse that are important to not throw aside. Erin Moore of FLOAT Architecture Research and Design notably designs projects influenced by these views. Her work focuses on the nature of architectural objects' interactions with the larger ecosystems and environment around them. Her structures are designed to decay and foster wildlife, or disassemble completely to be recycled post use without sacrificing the function they are playing for humans.⁹

Within her work she exemplifies that Posthuman thought does not necessitate the need to ignore human demands upon the architectural industry. Instead it asks us to rationalize the architectural objects being created outside of solely the human perspective and scale. To a large extent Posthumanist thoughts ask us to rationalize architecture as something existent through time and in a larger context. We can no longer simply rationalize it as only function, aesthetic effect, and form. Instead it has to be rationalized as all these things as they exist through time, and for more than just humans.

TIME AND OBJECTS

New Materialism, when addressing the environment, breaks architecture down into the role it plays within the larger ecosystems, flows, and structures of earth. At its base level one aspect of architecture is that we are ripping up matter somewhere on the planet, then relocating it in a specific way at another location. When we view architecture as a material flow, this becomes paramount to our understanding. The sourcing and decay of materials all become an inherent trait of the architecture. The entire architectural object is understood as the amalgamation of the material flows that constitute it.

These conceptions of architecture are important not to sacrifice. However, as we discussed, new materialism still fails to address function and aesthetics in a holistic way. OOO has the ability to discuss these flows while still having the ability to discuss function and aesthetics as long as we understand the object's relationship with time.

The standard interpretation of time within OOO is that it exists as the shifting of sensual qualities interpreted by real objects (ourselves or others). This shifting layer of qualities and the changes it undergoes constitute time. Within this view, we exist within the present as the past continually spans out behind us. This is called the "growing block theory". Harman describes time as the continual formation of objects and degradation of the same. This, however, leaves the future as something that does not exist.¹⁰ This would make architectural practice exceedingly hard. As we mentioned previously, the prediction of future degradation and decay is inseparable to

the understanding of how an architectural object WILL affect the environment.

To counteract this we can conceptualize OOO's objects within an eternalist view of time, or as we will refer to them 4-dimensional objects. Think of objects as having 3 dimensions in space and a fourth one through time, extending into both the future and the past. Within eternalism, the past, future, and present objects and events all exist. Objects then exist as flows through time, forming larger objects in conjunction with each other, as

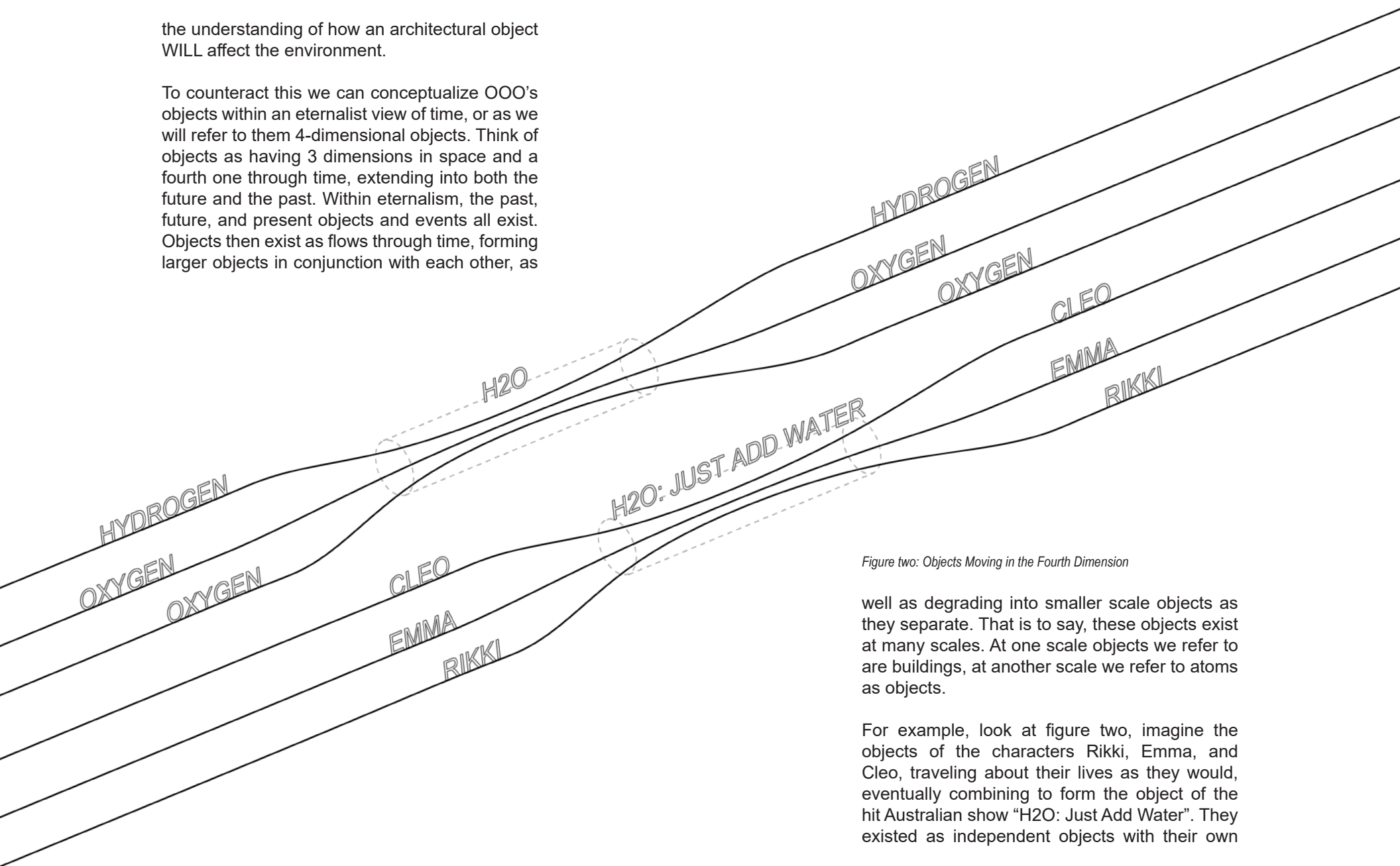


Figure two: Objects Moving in the Fourth Dimension

well as degrading into smaller scale objects as they separate. That is to say, these objects exist at many scales. At one scale objects we refer to are buildings, at another scale we refer to atoms as objects.

For example, look at figure two, imagine the objects of the characters Rikki, Emma, and Cleo, traveling about their lives as they would, eventually combining to form the object of the hit Australian show "H2O: Just Add Water". They existed as independent objects with their own



qualities before, combined into the larger object of the show which has its own qualities at one scale, while still maintaining their own qualities at another scale. Similarly hydrogen and oxygen exist as objects with their own properties on one scale but combine to form water with its own distinct qualities at another. At any scale objects have the ability to interact with other objects. It is important to note that none of this happens within a vacuum, and all objects are constantly interacting with each other. Rikki could have certainly had a conversation with Cleo well before the show H2O ever became an object.

This conception of time allows us to rationalize an architectural object in the same way. The architectural object still consists of smaller scale constituent objects. However it has its own functions, aesthetic effects, and environmental impacts at the scale of the whole. The same goes for every constituent object of the larger architectural object. We can extend this to understand that a specific beam of an architectural object was sourced from a sustainably farmed forest, or was torn up from the Amazon. Or on the other side of the timeline, a specific waterproofing in a wall contains chemicals that pollute the environment as it decays, or is recyclable and can serve the same function in a future architectural object as its current one decays. Objects have both relationships through time as well as relationships with other objects.

Function, aesthetics, and the environment are operating at different scales. This is inseparable from the nature of an architectural object, and shows up in the design process of the architectural object. Think of the movement in thinking between how the object is sitting in a site, to how two rooms are adjacent, down to the specifics of how a wall section will go together, and back up again. This negotiation of scale is important to gaining any sort of comprehensive knowledge of an architectural work. Beyond these scales in a physical sense are also scales of time that these objects function within. At larger scales there is erosion and shifting edges of forests, at smaller scales there is rust and the length of my fingernails getting longer.

For the sake of discussion let us separate these into three “main scales”:

URBAN AND NATURAL

There is the contextual scale of how the architectural object nests into the larger environment: its composition within a city grid, or its placement near a specific outcropping or lake. This also constitutes socio-political and economic environments. The city as an object, pressed against the lake edge for commerce, or wedged between two mountains to rest on flat ground. At this scale function operates as the way the object dialogues with the surrounding environment; how it holds or generates public spaces for sitting; or how it affects a city skyline. Broad cultural sweeps that define our architectural landscape.

This scale also dialogues with the time scales of whole cities and whole ecologies. Within it we see the shifting edge of a city as it expands outward or contracts seceding land to the natural environment. This scale also holds the shifting of sand dunes or the silt running down the side of a mountain with water. Here we are concerned with the larger architectural objects, the larger scales of time, or at least those which are practical to the architectural object.

The Aesthetic effects are akin to first impressions: how we see the object from a distance or outside, or how it reacts to the environment around it. At this scale the environment rises to the surface and is the main focal point of our understanding of the architectural object, like the locations of urban sprawl or density and their dialogue with the landscape.

MASS AND VOID

Zooming in slightly we arrive at the “human scale”, the scale that constitutes much of our interaction with the architectural object. The space that the object takes up (which we will refer to as “mass” or “massing”) consists typically of walls and ceilings, or the solids that make the exterior of the space that we occupy. This is the scale we attribute most of our aesthetic effects to, where we experience the play of light through mass and void. This is the scale at which we have windows, alleys, the street section, and so on. Objects here are at a scale comparable to the human body; the tension becomes a palpable sensual relationship between us as objects, the objects that surround us and the spaces between. Time

at this scale looks at the movement of the sun, and the breeze. Those smaller moments of time that permeate everyday life.

This scale lends itself readily to the aesthetic effects of objects. As we experience beauty in the first person, this scale is most in tune with how we perceive the world and requires less mental gymnastics to arrive at.

STRUCTURE AND SKIN

The construction scale, the scale at which the individual parts combine in forming the scale of mass and space. This is the scale at which the individual studs in walls exist, as well as the nails and screws holding them together. For Judd’s boxes we look at the way in which the individual slabs of concrete are brought together in order to form the larger blocks, The base piece of concrete nested between vertical pieces that support the spanning slab. The composition of these elements and how they react to each other.

This scale dialogues with function, at the scale of the hand. These are the qualities that are apparent in how we assemble larger objects, and the qualities of the smaller objects that make them up.

PHILOSOPHY CONCLUSIONS



Imagine an architectural object being constructed. If we rationalize it as 4D objects, we can see it as objects at the scale of “structure and skin” combining to form a larger object at the scale of “mass and void”, that then combines with adjacent architectural objects to dialogue at the scale of “urban and natural”. At each scale every discrete object can be assessed through function, aesthetics, and the environment. Even if each object is part of the same larger object, they each still have their own qualities.

Each object is a 4-dimensional object, whether designed or not. These objects extend into both the past and the future, exist at a specific scale, and consist of layers of sensual qualities that surround a withdrawn real object. We understand the object through its sensual qualities and through that process come to know the Sensual object, or the object as it presents itself to our senses. The architectural object itself necessarily has some dialogue with function, aesthetics, and environment. By conceiving of architectural objects this way we can easily discuss function as a quality that is had by the object itself, presented to us via its sensual qualities but still pertaining directly to the real object. While aesthetic effects exist as a tension between the architectural object’s real object and the sensual qualities we perceive in the object. When we think of these objects and their qualities (concepts we borrowed from OOO) as extending into the past and future, and constantly forming and breaking apart from larger objects, we can rationalize them in the same way a new materialist thinker might. Allowing us to discuss architectural objects across scales, and how they pertain to function, aesthetics, and environment.

We can essentially utilize OOO’s qualities and structures of objects, and New Materialism’s flows in tandem when discussing architecture so long as we understand the objects to exist in four dimensions. As to the direct application of these concepts to the field of architecture we will dive into in the next pages. What was outlined and argued here will provide a conceptual framework for our discussion.

PARTICULAR APPLICATIONS WITHIN THE FIELD

The design process is frequently viewed as a supply-demand relationship in which a client asks the designer for some object and the designer delivers said object. Where the process becomes entirely economic in nature generating 'commodified space', wherein good design becomes commodity along with the spaces it provides. Similarly there are market demands to create space that will only last a short amount of time but will be highly profitable. The function and service provided by the built work in the present and short term become the only goal of the design process. When the given design has an impact far beyond this immediate time scale of function, having both an aesthetic effect and environmental impact at the same time.

When we begin to rationalize the architectural object in 4-dimensions we cannot logically generate something that is designed solely for profit, there is an understanding that the object will have an impact on the environment (ecological, cultural, and political) through time. The design object has to be designed in such a way that it's efficient throughout the extent of its life. Be that the process in its eventual past that brought it into existence, or the decay in the inevitable future that will bring it out of existence. It is my intention with the rest of this project to explore what exactly this 4D architecture looks like, and what its true applications might be.

PARTICULAR CRITIQUES

Let us turn to some works of architecture and art in order to both apply this method of thinking, as well as to refine it further. The works selected are ones that I believe to be at least partially in line with this way of thinking.

DONALD JUDD: Untitled Works in Mill Aluminum

Judd's work in mill aluminum consists of 100 boxes of the same size with various subdivisions made to the interior. The boxes are arranged within a modified artillery shed, the modification being the addition of an arched roof to the outside as well as large windows.

Judd's boxes catch the light coming in from the windows and the aluminum they are made of reflects and plays with the lights and colors around them. This work is highly successful in its beauty and generation of aesthetic effects. This I believe is due to the boxes ability to hide their Sensual Qualities that we want to assign to the sensual object. As we look at the boxes we first are presented with the typical qualities we ascribe to mill aluminum, its reflective qualities, its apparent weight, and the blue gray sheen of the metal (Sensual qualities). From our base understanding of aluminum, we assume some things about these objects including the qualities we just listed being present. However, as we look longer at the boxes these qualities fade. The surfaces reflect light and catch it changing the color of aluminum within, or at moments the boxes seem to vanish from our perspective and instead we look through them at the landscape beyond. The sensual qualities we come to expect from the boxes dissolve and we are left



100 Untitled Works in Mill Aluminum, Donald Judd. Image: Chinati Foundation.¹¹

with something we need to interpret, there are qualities that are seemingly attributed to the box but they are not in line with the Sensual object we know it to be. Instead we are generating a new real object which is the box but with these new mysterious qualities or qualities from the landscape taken on.

I'm beginning to understand this as a goal of art and aesthetics. The goal becomes creating an object that has sensual qualities that are elusive to the point where its sensual qualities fade and we are forced to interpret a new real object we are generating in tandem with the sensual object inherent to the object.

Another way to explain this, when we look at Judd's boxes we initially view the box. However as the light play changes the qualities we ascribe to the box, we lose track of the sensual qualities we ascribe to it and instead are left looking at what should be the box but no longer has the qualities we expect. It is our awareness of the sensual object and the lack of ability to grasp the sensual qualities that are apparent, that makes the beauty we see inherent to it. We are forced to interpret this inherent disconnect. The boxes generate a tension within themselves between our expectation or nostalgic memory of what the box is (its sensual object) and the new real object, with qualities we cannot ascribe to the sensual object we are trying to understand it as.

Aesthetic effects then seem to be born at least partially from the object's relationship with time. It is only because of our relationship with the object in the past (and our understanding of its sensual qualities then) that we can, in the present moment, understand there is a tension between

what we just saw and what we are experiencing.

But what brings about this disconnect? Is it the reflectivity? Is it solely material in nature? If we stare at any piece of milled aluminum can we get the same effect?

RICHARD SERRA: Delineator

Richard Serra's *Delineator* presents a different kind of tension. The work consists of two steel sheets within a gallery space, one lies flat upon the floor, while another is held flat against the ceiling, apparently floating. We are aware that steel is heavy, this is a quality that we associate with steel, we are also aware that steel does not float. We are aware that in air, very few things float but something that is certainly not on this list is steel.

We are very aware of these sensual qualities ascribed to Serra's objects, however his arrangement of these pieces subverts these qualities, the steel on the ground and the steel held in the air generate a palpable sense of tension, a tension that I would say is even spatial.

It's Serra's human scale tensions that become more applicable to architecture. Not to say Judd's light play and dissolving of the boxes isn't architectural, it is just not playing with space in the same way. (Judd's work in concrete, is at a much larger scale than the aluminum works and speaks to the scale of Mass and Void, it is a quality specific to the aluminum boxes we are discussing here not Judd's work on the whole.)



Delineator, Richard Serra. Image: Gordon Matta-Clark.¹²

There is of course the space between the aluminum boxes and the artillery shed, and this operates on the scale of mass and void, however for the boxes I'm more concerned with the qualities internal to them. Serra's work, in contrast, deals very little with the individual qualities of each sheet of metal.

Serra's tensions are almost exterior to the object itself, there is an argument that the two metal pieces form one larger object, however this object is still radically different from the tensions apparent internally in each of Judd's boxes. Within Judd's work the tensions, and spaces are internal to the box; we experience the metaphor as something that is "over there". Serra's work expands outward swallowing the center of the room in tensions and dissolved sensual qualities, the work is spatial on a human scale as opposed to the box scale. Judd's work in Mill aluminum operates on the scale of "Structure and Skin", dialogue with our hands, the tactile scale of the human. While Serra is operating at the scale of Mass and Void, the tension here is in the weight of the void that is held between opposing, oppressive masses.

JOHN CHAMBERLAIN: *Mr. Press* and JACKSON POLLOCK: *Number 1A*

Chamberlain's *Mr. Press* explores a different way to dissolve the sensual qualities of a given object. The object as a whole consists of individual objects, mainly car parts, that lose their individual qualities within the larger composition. The sensual qualities of the individual objects dissolve in the complexities of a larger composition that



Mr. Press, John Chamberlain. Image: Judd Foundation¹³



Number 1A, Jackson Pollock. Image: MoMA Conservation.¹⁴

is reminiscent of renaissance relief sculpture. The work is organized in a very classical style, large plains back dropping dramatic diagonal elements. As we look at it we lose ourselves in whether the focus is the larger composition or the constituent objects. It effectively plays with our sense of scale, our mind is constantly trying to distinguish parts from whole, this work tries to diminish the parts qualities in favor of the whole creating tensions within the larger object itself. We oscillate between the scale of “Structures and Skin” and “Mass and Void”. We want to understand each piece individually as well as the whole, however this escapes us as each scale hides sensual qualities of the other.

Pollock employs a similar strategy to chamberlain, both coming to prominence around the same time and following in the footsteps of Clifford Still. The larger composition consists of smaller discrete elements that lose their individual qualities in favor of making up some unknown qualities of a larger whole. In this case though the smaller constituent objects are drips of paint as opposed to car parts. They still have the same purpose of continually dissolving their qualities to create tensions between the larger object and the constituent objects making it up. The paint dissolves like leaves in a tree when the leaves briefly lose their qualities in favor of forming one abstract green mass.

These contrast the works of Judd and Serra as the tension here is happening across scales. In Judd and Serra’s work all of the tensions between qualities of the objects happen within a singular scale of objects, Judd’s boxes at “Structure and Skin” and Serra’s steel at “Mass and Void”. Pollock and Chamberlain instead bring our focus

from one scale to another repeatedly. We lose qualities of the objects as they exhibit qualities on multiple scales. For example, think of a block of concrete. Concrete exhibits the same tactile sensual qualities at the scale of our hand, however a small block of concrete feels radically different than a monolithic tower. We lose some quality of the smaller concrete block and gain another in the tower, depending on the scale that our mind is operating on when assessing the object. This form of aesthetic effect is already existent within the realm of architecture.

MARK FOSTER GAGE ARCHITECTS: Helsinki Guggenheim and KENGO KUMA: GC Prosth Museum

Mark Foster Gage is an active participant within the discourse around OOO in the field of architecture. Within his Helsinki Guggenheim proposal we see a prime example of his application of OOO within his practice. Gage envisions a building as an “encrusted object” in which it is surrounded by so many discrete objects of varying sensual qualities that we are drawn to the mysterious real object inside. Instead of dissolving the sensual qualities of the object Gage compounds them. Gage focuses on the idea of the withdrawn real object, He hides the real object of the building behind the layer of sensual objects. This line of thinking for me however does not generate enough tension to create a profound aesthetic effect. Instead the tensions between the merged sensual objects present a much more complex aesthetic effect I am far more interested in. The design object plays



Helsinki Guggenheim Proposal, Mark Foster Gage Architects. Image: Mark Foster Gage Architects¹⁵



GC Prostho Museum, Kengo Kuma & Associates. Image: Daici Ano.¹⁶

the same game that Pollock and Chamberlain's works do. We are stuck oscillating between scales and so never fully read the sensual object presented to us. We are left grasping at a real object that is inaccessible to us.

The discrete objects that create the layer around the real object in Gage's work consist of

“recycled digital materials,”- objects that were randomly downloaded from various online sources but have no intentional existing relationships with one another or larger symbolic agenda”¹⁷

Or objects that exist divorced from the immediate environment surrounding the object. Instead these objects are imported from the global digital environment. This generates a tension with the place that is almost palpable, the object becomes looming, divorced from the environment it is within and responding to the entirely human based objects of the internet.

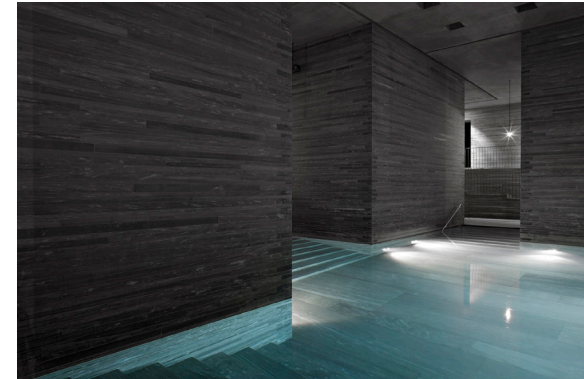
Let's contrast this with the architectural work of Kengo Kuma specifically within his GC Prostho museum. Compositionally the project relies on many replicas of the same constituent object that then makes up the whole of the larger architectural object. This is in the form of a repeating cidori grid throughout the project. The cidori grid is derived from a traditional toy the construction method of which has been practiced and maintained by a small mountain town north of the museum.¹⁸ The individual objects of the larger grid of the museum are directly derived from the cultural environment of the museum itself. While the grid itself acts in a similar fashion to Gage's random objects, creating a

shifting layer of qualities to both hide and hint at the underlying real object. The constituent objects of Kuma's project form a much more cohesive relationship with place. The dialogue is direct and applicable and devoid of tension. The tension instead existing within the intricate light lay through the airy chidori grid. There is a nuance and subtlety to the tensions in the GC prostho museum that appear to be lacking in the Helsinki Guggenheim proposal. With Kuma we are less aware of the conflicts between objects, it is felt in both, but Gage's project screams it while Kuma's whispers.

PETER ZUMTHOR: *Therme Vals*

Let us turn to an architectural object that contains less of a multiplicity of objects. Zumthor's work is more akin to Judd's boxes in Mill Aluminum. Here it is the composition of material in contrast to light that allows for its sensual qualities to dissolve generating the atmospheric effect we see in Therme Vals. Here the discrete objects that make up therme vals play less of a role, it is instead the larger object that is dissolving its sensual qualities.

Zumthor's work is a prime example of how larger objects' sensual qualities can dissolve to create tensions and atmospheres. This route is vastly different from Foster Gage's large object encrusted with discrete objects. Zumthor's work does not rely on constituent parts dissolving but instead the work as a whole dissolves. The sensual object of "bath house" presents us with quarry like qualities that cannot be held by it. This in turn creates a profound atmosphere.



Therme Vals, Peter Zumthor. Image: Nico Schaerer.¹⁹

Zumthor's work, similarly to Kuma's, utilizes materials that originate in the local cultural environment. The stone that is used in the construction of therme vals is sourced from nearby quarries. Beyond the tension in the material, sensual qualities of the stone, Therme Vals utilizes a similar strategy to Serra's Delineator. Within the ceiling of Therme Vals, there are intentional cracks that lead upwards through the stone to the sky. These cracks put the weight of the ceiling into perspective for the inhabitant. If the ceiling was flat the occupant would have no frame of reference as to how thick the ceilings of the object were, they could be 1 foot thick or ten feet thick and they would still be viewing a flat plane. However, the crack in the ceiling allows the occupant to observe the exact depth of the ceiling, creating a sense of weight that would not otherwise be apparent.

Between the stone and the perceived weight of the object as a whole, it shifts the timescale at which we comprehend the object. There is the immediate time scale that we exist within and understand most things through. But, beyond this we also begin to rationalize Therme Vals as something that is Geologic in nature, the object becomes part of the mountains. Our mind immediately begins to wander towards the ruins of the bathhouse in the distant future, as the bathhouse slowly degrades away into sediment coursing down the mountain valley it lies within.



Wash Monolith. Image: Hallie Letsinger.²⁰

WASH MONOLITH

To begin to explore these ideas I've been constructing or creating models, sculptures, and paintings of architectural objects, before I introduce the routes this research and analysis might take into the future allow me to unpack some selections from the work I've done up until the present.

The Wash Monolith explores notions of object and how we can arrive at aesthetic effect via the juxtaposition of objects. This exploration however I believe shed light on some of the other ideas present within these thoughts, namely notions of scale and time.

The two objects exist in a given location in space set into a wash. This creates a void of negative space between them. This tension generated by their arrangement opens up the potential for aesthetic effects. This I believe to be the potential

for aesthetic affects all objects exhibit. Objects can generate aesthetic effects simply through careful arrangement and composition. The slabs on their own have sensual qualities that we are constantly privy to. These being all our thoughts and sensations associated with concrete. But beyond these are the sensual qualities that only come about due to the relationship between the two slabs or the relationship between the two slabs and the landscape (environment). It is interesting to me that when imagining a single slab the effect seems to be less than the two together. One concrete slab on its own in the wash is not nearly as spatial. A single slab would only dialogue with the environment and not present any tensions within the composition. It is the relationship between the two objects that generates the tension.



Wash Monolith. Image: Hallie Letsinger.²⁰



Wash Monolith. Image: Hallie Letsinger.²⁰

The context of the slab dictates our perception of the object. The moment we change the number of slabs from one to two, and arrange them just so. Our perception shifts, there is very obviously now an aesthetic element to the slabs. The objects gain an inherent tension between each other and the environment.

Due to its location within the landscape, it inadvertently begins to dialogue with time. The monolith is placed in a wash where water flow will erode away portions of the concrete in time, already by the time of these pictures the monolith is shaping the erosion of the landscape. I find some level of metaphor and poetry in the juxtaposition of the mountains in the background, showing the erosion of thousands of years of rain, contrasted with the monolith, showing the same form of erosion but instead months old. These objects experience a similar relationship with time despite the seemingly vast differences in their sensual qualities.

This makes me wonder what the role of time is within the impact of this object. Do the real qualities change in time? How does that affect the monolith and our perception of it?

UNTITLED #4

Untitled #4 begins to question persistence and objects. In this we take a given object, the coffee mug, and project it through time to analyze its relationships, between the given instances of the object through time. Necessarily we are taking



Untitled #4

snapshots of its existence, not showing every infinite instance of existence.

It's interesting to me that the mug doesn't seem to lose its identity as a mug through the process of decay, for this I see two possible reasons. Either, this is due to the mug never losing its function, it always in this depiction can hold some form of liquid, or it is because it is being viewed in relation to its first instance as a full mug before experiencing decay. I don't know if this piece offers an answer, I would prefer it if the mug is always itself however if the depiction were to show only one of the further right instances I do believe it would be very hard to say "that is a mug", sure it would still be a vessel that is capable of holding liquid and one obviously in a state of decay but it would be hard to say "that is a mug".

I wonder if there is a separate aesthetic effect that is only present through time. Or at least tensions that are only present in an object's relationship with it. To some extent at least all of our perception of aesthetics rely on nostalgia and memory. We are constantly forming a memory of the object before us as time moves. In the present we only have access to the very specific sensual qualities that are attributed to our current view of the object. We never see the back side of the mug. Even if we could rotate the mug we could never hold the entirety of the object's qualities in the present; some of the qualities we know the mug to have will only be present within memory. Memory, nostalgia, and time then must play an active role in our perception of aesthetic qualities. The tension between qualities of an object only come into existence when played out across time, held within our memory.

It is in this way that we come to know the aesthetic effects of an object. We play an active role in interpreting the tensions through time.

WHITE ON WHITE #6-8

Continuing to think about time and nostalgia's role in our understanding of aesthetics, I conceptualized the "White on White" series of models as abstracted urban landscapes defined solely by shadows and tensions. White on White #6-8 exist as compositions in relief, where shadows define the form itself. The 2D composition is created only by the shadows cast in 3D.



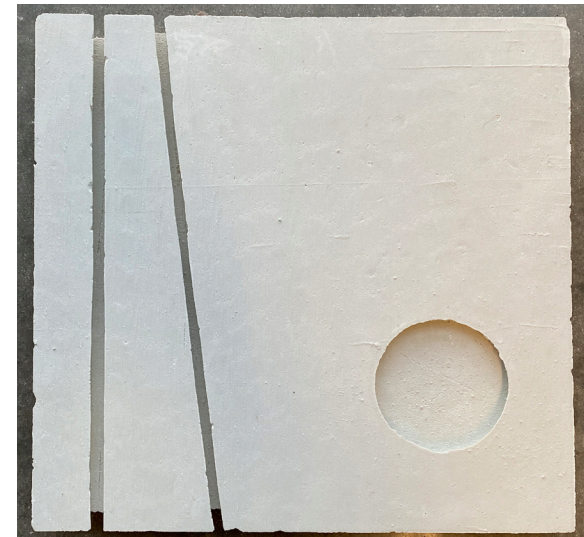
White on White #6



White on White #7

That is to say the intended design object, the 2D object, is only created when the shadow is cast onto the plane in three dimensions. We as three dimensional entities can see the entirety of this process in three dimensions, and have to imagine the 2D composition. I do feel visually this exercise was largely unsuccessful. However the thinking behind it remains relevant to my thoughts.

Specifically what a 3D object projected from a 4D one would look like, specifically in an architectural context. Is there a methodology of design in which construction, use, and decay all happen at the same time? The past, present, and future collapsed onto a singular moment of time. If our conception of aesthetics is as temporal as it seems, then naturally the next step would be to create an object that remains in a sort of temporal flux. That is constantly in change and movement.



White on White #8

CONCLUSIONS AND ROUTES FORWARD



A truly four-dimensional work of architecture then would exhibit some element of constant adaptation. This could be as simple as walking from one room to another at the scale of “Mass and Void”, or the shifting edge of the “Urban and Natural”. There is a tendency to view the urban fabric and architectural fabric as something that is stationary and solid, when it is really a four-dimensional object and should be designed as such. Certain elements may be sturdier, becoming nodes in the long process of decay, think of earthen structures. While others may be designed to last far shorter amounts of time, think of tents. These structures and ones that exist at all the timescales in between all play a role within the urban fabric. However, they are infrequently assessed by their function outside of the present moment. When we do assess these objects outside of the solely the present moment, we are able to design more holistically and in regard to more of the forces at play within the design process.

environment about how they can foster a shifting culture and adapt to its needs through time. Similar to a changing culture they will attempt to have adaptable function, function that is open to interpretation by the occupant through time. Three objects will be designed in tandem, one at each of the three scales mentioned above: “Urban and Natural”, “Mass and Void”, and “Structure and Skin”. In order to ground these objects environmentally and functionally, they will be situated in Tucson. The preliminary goals and values that will be studied and measured are the object’s benefit to the environment, functionality, and potential for aesthetic effect. The hope is that through this philosophical lens we can have a better conception of architectural objects’ relationship with function, aesthetics, and environment as they pertain to time.

4D OBJECTS

Towards these ends, the following spring 2024 semester will be dedicated to the study of and creation of “4D Objects” or objects with an explicit dialogue with time. This will necessarily dialogue with the environment, function, and aesthetic effects. Environment, in how they are created through time as well as their decay through time. What effects do the objects have on the environment? How can they be designed to have as minimal of an impact or a positive one. They will also dialogue with their cultural

SPRING 2024

P1

2 wks - Pre Design (Site Analysis)

Define performance goals/values and how that will be studied/measured
Clarifying ethical stance
Parti/Site Analysis (through time)
Topography/Site plan (through time)
Master plan

2 wks - Schematic design

Project Diagram - intent, goals, concept, process
Developed Site Plan and site sections
Developed physical Models
Finalized Mater Plan - preliminary Floor plan
Exploration of representation methods and language
Refine and solidify Project Goals and Values
Refine and solidify Performance Goals and Values

P2

2 weeks - Structural studies and concepts

Test Project goals and values
Test Performance Goals and values

2 weeks - Design Development

Study Models
Material assemblies
Performance diagrams, testing

P3 - 4 wks

Design Drawings - Refine structural models
Measure Project Goals and Values
Measure Performance goals/values
Further Model Explorations at varying scales
Final Presentation

P4 - 4 wks

Synthesis & Exhibit
Refine exhibit, presentation, models, and drawings
11x17 booklet

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